March 30, 2018

Mr. George Faison
U.S. Environmental Protection Agency
OSWER, ORCR
1200 Pennsylvania Avenue, N W
Mail Code 5303P
Washington, DC 20460

RE: Self-Implementing Determination for Non-Hazardous Secondary Materials Rule.

Mr. Faison,

National Energy USA is submitting this letter on behalf of our client, WastAway, LLC (WastAway), an equipment manufacturer and technology provider based in Tennessee. We are requesting that the U.S. Environmental Protection Agency (EPA) evaluate WastAway's processed engineered fuel (called "Fluff") as a non-waste fuel product under the Non-Hazardous Secondary Materials (NHSM) rule. Supplemental information and analyses by third-party independent engineering firms such as Koogler & Associates and TetraTech are being provided regarding the process and product specifications (Attachments 1 & 2, respectfully). In separate phone calls, representatives from WastAway and National Energy discussed with EPA representatives how WastAway's fuel meets the criteria under the NHSM rule.

To be designated as a non-waste fuel under 40 CFR 241.3(b)(4), the regulations require that processing of the NHSM meet the definition of processing in 40 CFR 241.2. After processing, the NHSM must also meet the legitimacy criteria for fuels in 40 CFR 241.3(d)(1). Units that combust NHSM as fuels that do not meet these requirements must meet applicable emissions standards issued under section 129 of the Clean Air Act (CAA). Given this testing and analyses, we can demonstrate that WastAway's engineered fuel meets the legitimacy criteria (per 40 CFR 241.3(b)(4)) and, thus, should be considered a non-waste fuel.

Based on all the information provided in the Koogler Assessment Letter and other supplemental materials, as well as information provided during phone discussions with EPA officials, we believe that WastAway's engineered fuel would be considered a non-waste fuel under the 40 CFR part 241 regulations provided the specifications identified in the request are maintained, including, but not limited to, the moisture and ash content remain at 12% or less, the chlorine content remains less than 0.3% and the sulfur content remains at or above a 1:1 stoichiometric ratio with chlorine, determined by daily composite sampling. The remainder of this letter provides the basis for our position, including the reasons for these conditions. If these conditions are not maintained, the Agency may reach a different conclusion.

Note that a non-waste determination under 40 CFR Part 241 does not preempt a state's authority to regulate a Non-Hazardous Secondary Material as a solid waste. Non-hazardous secondary materials may be regulated simultaneously as a solid waste by the state, but as a non-waste fuel under 40 CFR Part 24 1 for the purposes of determining the applicable emissions standards under the Clean Air Act for the combustion unit in which it is used.

Background Information on WastAway

WastAway, LLC has operated a full-scale production facility since 2003 in Morrison, Tennessee and has developed a non-hazardous, waste-derived engineered fuel that has been tested multiple times in a co-fired application in a boiler. The technology was co-developed under a Cooperative Research and Development Agreement (CRADA) with the U.S. Army Corps of Engineers. The process yields an engineered fuel product referred to as "Fluff" that is then sold to other end-users in the United States and around the world.

National Energy and WastAway have been actively developing projects throughout North America. WastAway's fuel has been tested and approved for use in Vancouver, British Colombia. The fuel buyer is a major cement manufacturing and has been given all the approvals to co-fire the engineered fuel with coal in its plant in Delta, Vancouver, British Colombia. We are now in the final stages of stormwater permitting for our proposed facility in Canada.

WastAway's fuel is intended for use as a substitute for both coal and biomass in stoker boilers. The primary feedstock is derived from materials that would otherwise be landfilled and consists primarily of organics, wood, paper, cardboard, and plastics. Metals, glass, and inerts are screened out of the incoming waste stream. The processing facility will be part of an innovative Materials Recovery Facility (MRF) operated by National Energy. The facility will receive Municipal Solid Waste (MSW), as well as some types of commercial waste.

The fuel can be engineered to meet the end-users' specifications for heating value, material composition, size, density, and moisture content. The following fuel specifications are based upon a Moisture Content of 15%:

- Plastics: 25% (PVC is removed)
- Paper and Cardboard: 40%
- Organics: 20%
- Polystyrene: 5%
- Residual Waste: 5%
- Fuel/Heat Content: 8,500 Btu/lb - 9,000 Btu/lb
- Chlorine Content: 0.1% - 0.3%
- Sulfur Content: At or above a 1:1 stoichiometric ratio with chlorine

The fuel is hydrophobic, non-leachable, pathogen-free, and odorless. It can be pelletized with a typical size of 2" minus and formed by heat and compression with no binding agent. The final moisture content will be at 15% or less, based on the end-user's specifications.

<u>Processing</u>

Processing is defined in 40 CFR 241.2 as operations that transform discarded NHSM into a non-waste fuel or non-waste ingredient, including operations necessary to remove or destroy contaminants, significantly improve the fuel characteristics such as sizing or drying of the material, in combination with other operations; chemically improve the as-fired energy content, or improve the ingredient characteristics. Minimal operations that result only in modifying the size of the material by shredding do not constitute *processing* for the purposes of the definition.

The determination of whether a particular operation, or set of operations, constitutes sufficient processing to meet the definition in 40 CFR 241.2 is necessarily a case-specific and fact-specific determination. This determination applies the regulatory definition of processing to the specific discarded material(s) being processed, as described in correspondence and supporting materials, taking into account the nature and content of the material, as well as the types and extent of the operations performed on it. Thus, the same operations may or may not constitute sufficient processing under the regulation in a particular circumstance, depending on the material being processed and the specific facts of the processing. In some cases, certain operations will be sufficient to "transform discarded non-hazardous secondary material into a non-waste fuel" and in other cases, the same operations may not be sufficient to do so.

WastAway's production process involves the following stages discussed in detail in the Koogler & Associates assessment (Attachment 1). This includes:

1) Pre-Production/Waste Stream Segregation;

2) Processing of Segregated Waste Streams; and

3) Final Engineered Fuel Processing.

Based on this description of the three stages, the Koogler Report concludes that WastAway's operations meet the definition of processing in 40 CFR 241.2 and will transform waste materials into a processed, non-waste fuel. Specifically, incoming materials undergo inspection to ensure no waste ban material remains in the feedstock. Over-belt magnets remove ferrous material and bulky items and questionable material are removed by hand at the tipping floor. Near-Infrared Spectroscopy (NIRS) equipment allows for identification and removal of contaminated materials, such as PVC. Air separators separate the material into light and heavy fractions, subsequent material is inspected via an eddy current analyzer, while an optical sorter identifies and removes materials not meeting WastAway's fuel specification. The "Fluff" material can then be processed through an extruder for final pelletization, if required by the end user. The Koogler report concluded that these operations clearly meet the threshold for "minimal operations" described in the Part 241 processing definition.

Legitimacy Criteria

Under 40 CFR 241.3(d)(1), the legitimacy criteria for fuels include:

1) The management of the material as a valuable commodity based on the following factors; storage prior to use must not exceed reasonable time frames, and management of the material must be in a manner consistent with an analogous fuel, or where there is no analogous fuel, adequately contained to prevent releases to the environment;

2) The material must have a meaningful heating value and be used as a fuel in a combustion unit that recovers energy; and

3) The material must contain contaminants at levels comparable to or less than those in traditional fuels which the combustion unit is designed to burn.

Valuable Commodity

The finished fuel is moved to a holding area for truck load-out delivery to the customer. National Energy's facility has a storage capacity of 1,200 tons, but the system is designed for daily deliveries of the plant's output. Two trucks will be used for transporting the fuel to our customers by walking floor trailers. It is expected that the fuel will be transported six days per week, based on the volumes indicated in our fuel contracts. National Energy does not anticipate any on-site fuel storage for any prolonged period of time. The attached letter from Lehigh Cement shows that the engineered fuel has a significant market value for end-users around the world interested in reducing air emissions by using a cleaner fuel.

Meaningful Heating Value and Used as a Fuel to Recover Energy

Regarding the second legitimacy criterion, WastAway's equipment has the ability to screen out PVC plastics and inert materials out of the incoming waste stream to meet specific end-user's needs. The average heating value is typically 9,000 Btu/lb (Attachment 3). The fuel will be used as a fuel in a combustion unit that recovers energy.

EPA states in the preamble to the NHSM final rule, NHSMs with an energy value greater than 5,000 Btu/lb, as fired are considered to have a meaningful heating value. WastAway's fuel specifications assert, and the Koogler report substantiates, that the fuel can have moisture levels as high as 15%. Assuming a 15% moisture level, WastAway's fuel would still have an as-fired heating value between 8,500 and 9,100 Btu/lb. Thus, WastAway's fuel meets EPA's meaningful heating value criterion.

Comparability of Contaminant Levels

Regarding the third legitimacy criterion, we submitted summary tables comparing contaminant levels in traditional fuels (specifically, coal and wood and biomass) with concentrations found in the WastAway's fuel. These data reflect the results from independent lab analyses. A direct contaminant-to-contaminant comparison of these updated results are included as Appendix 1. Based on this contaminant-to-contaminant comparison, all contaminants in WastAway's fuel are comparable to or lower than those contaminants in both coal and wood/biomass.

We note that the contaminant data submitted indicated: 1) detection limits higher than the traditional fuel contaminant concentrations for metals; and 2) contaminant concentrations for the non-metal elements below traditional fuel concentration levels, but higher than those values reported in the subsequent submittal. The analysis stated that the differences in the two sets of data were due to a change in the lab performing the analysis which resulted in lower detection limits and implementation of increased quality assurance procedures over time.

The conclusion that WastAway meets the contaminant legitimacy criterion for units designed to burn coal or biomass assumes that the fuel was tested for any contaminant expected to be present. Additional contaminants for which WastAway was not tested must be present at levels comparable to or lower than those in the appropriate traditional fuel, based on specific knowledge of the material.

Conclusion

Overall, based on the third-party information provided, and as described in the supplemental information, we believe that the WastAway fuel meets both the processing definition and the legitimacy criteria outlined above. These specifications include, but are not limited to, the moisture and ash content are maintained at 15% or less, the chlorine remains less than 0.3% and the sulfur content remains at or above a 1: I stoichiometric ratio with chlorine, as determined by daily composite sampling. These specifications/conditions will ensure the consistency and homogeneity of the fuel and ensure that it would not contain waste materials for combustion. Accordingly, we would consider the fuel as a NHSM non-waste fuel (as described in this letter) under the 40 Part 241 regulations.

Respectfully,

Dave Robau, CEM, LEED AP BD+C
CEO & Chief Scientist

NATIONAL ENERGY USA
13 S. Palafox Street, 2nd Floor
Pensacola, Florida 32502

Attachments:

1) Koogler & Associates Assessment Letter
2) Tetra-Tech Fuel Analysis
3) Calorific Analysis & Stack Test Results
4) Lehigh Cement Letter of Support

Appendix 1

Compound	Units	Literary Sources[1]		OAQPS Databases[1]						**WāstAway Fluff[2]**			
		Wood and Biomass		Wood and Biomass			Coal						
		Min.	Max	Min.	Max	Avg.	Min.	Max	Avg.	Min.	Max	Avg.	90% UPL[3]
Antimony (Sb)	ppm	ND	**26**	ND	**6.0**	0.9	ND	**6.9**	1.7	35.7	54.3	46.1	**49.6 (a)**
Arsenic (As)	ppm	ND	**6.8**	ND	**298**	6.3	ND	**174**	8.2	1.6	2.5	1.9	**2.1 (a)**
Beryllium (Be)	ppm	--	**--**	ND	**10**	0.3	ND	**206**	1.9	0.02	0.17	0.07	**0.10 (a)**
Cadmium (Cd)	ppm	ND	**3**	ND	**17**	0.6	ND	**19**	0.6	0.8	1.3	1.0	**1.1 (a)**
Chromium (Cr)	ppm	ND	**130**	ND	**340**	5.9	ND	**168**	13.4	33.2	58.5	41.3	**45.8 (a)**
Cobalt (Co)	ppm	ND	**24**	ND	**213**	6.5	ND	**25.2**	6.9	6.3	9.8	7.7	**8.3 (a)**
Lead (Pb)	ppm	ND	**340**	ND	**229**	4.5	ND	**148**	8.7	80.3	124	103	**112 (a)**
Manganese (Mn)	ppm	7.9	**840**	ND	**15800**	302	ND	**512**	26.2	117	390	164	**212 (c)**
Mercury (Hg)	ppm	ND	**0.2**	ND	**1.1**	0.03	ND	**3.1**	0.09	0.08	0.14	0.12	**0.13 (a)**
Nickel (Ni)	ppm	ND	**540**	ND	**175**	2.8	ND	**730**	21.5	8.6	33.5	14.9	**19.5 (a)**
Selenium (Se)	ppm	ND	**2**	ND	**9.0**	1.1	ND	**74.3**	3.4	0.5	0.6	0.5	**0.5 (a)**
Total SVM	ppm	ND	**345**	ND	**255**	6.2	ND	**241**	12.7	82	126	105	**113 (a)**
Total LVM	ppm	ND	**187**	ND	**867**	20	ND	**580**	32	92	138	112	**104 (a)**
Chloride	ppm	ND	**2600**	ND	**5400**	259	ND	**9080**	992	2980	3190	3081	**3123 (a)**
Fluoride	ppm	ND	**300**	ND	**128**	32.4	ND	**178**	64.0	584	1090	893	**1010 (a)**
Total Halogens	ppm	ND	**2900**	ND	**5528**	291.4	ND	**9258**	1056	3575	4294	3985	**179 (a)**
Total SVOCs	ppm	1.6	**27.0**	--	**--**	--	28.3+	**2243+**	--	448	660	534	**577 (a)**
Formaldehyde	ppm	1.6	**27.0**	--	**--**	--	--	**--**	--	2.9	7.9	4.0	**4.97 (b)**
Nitrogen	wt %	0.02	**3.95**	0.22	**0.46**	0.346	13.6	**54.0**	15.1	0.9	1.0	1.0	**1.0 (a)**
Sulfur	wt %	ND	**0.87**	ND	**0.61**	0.070	0.74	**61.3**	13.6	0.2	0.2	0.2	**0.22 (a)**
HHV	Btu/lb	--	**--**	--	**--**	--	--	**--**	--	8214	8782	8532	**8650 (a)**
Moisture	wt %	--	**--**	--	**--**	--	--	**--**	--	1.6	2.9	2.2	**2.4 (a)**

[1] EPA Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.
[2] WāstAway Fluff. Sampling Occurred Between 3/17/2014 – 3/27/2014. All values reported as Dry Basis.
[3] UPL, or Upper Prediction Limit, based on the type of distribution that best fit the data for the contaminant.
Notes: (a) Data appear Normal at 5% Significance Level - Used Normal Statistics; (b) Data appear Lognormal at 5% Significance Level - Used Lognormal Statistics; (c) Data Do Not Follow a Discernable Distribution at 5% Significance Level - Used Nonparametric Statistics
* - See above discussion of volatile organics from clean wood in comparison to C&D wood formaldehyde (pages 2-4)
HHV – High Heating Value; SVM – Semi-Volatile Metals (Pb, Cd, Se); LVM – Low Volatile Metals (Sb, As, Be, Cr, Co); Nickel and manganese generally act as low-volatile metals, and their much higher concentration in solid traditional fuels relative to arsenic and chromium would otherwise make a non-representative comparison. As such, nickel and manganese were not included in the grouping of LVM metals in this contaminant comparison.
+ Values taken from the Coal Literary Sources presented in EPA's Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.

July 1, 2014

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352/377-5822 ■ FAX/377-5822

Mr. Bill Martin, Vice President and General Counsel
WāstAway, LLC
195 Mt. View Industrial Drive
Morrison, TN 37357

RE: Company Internal Assessment Report
40 CFR 241 - Status of WāstAway Fluff for use as
Alternative Fuel Material

Dear Mr. Martin:

Koogler and Associates (Koogler) appreciates the opportunity to provide WāstAway LLC (WāstAway) with an assessment regarding WāstAway's alternative fuel material product called Fluff®, referred to herein as "Fluff". This assessment addresses whether or not Fluff would be identified as a "solid waste" per 40 CFR 241 (Identification of Non-hazardous Secondary Materials as Solid Waste (NHSM rule)) for purposes of air emissions regulation under the federal Clean Air Act (CAA), Section 129 when used as a fuel source in a combustion process for energy recovery. If Fluff were to be considered a solid waste, the combustor of Fluff would be regulated as an incinerator under Section 129 of the CAA. Based on the information and data provided by WāstAway, the applicable federal rules and guidance, and Koogler's prior experience with similar assessments, we have prepared the following analysis to provide an assessment for internal company purposes. It should be noted that the U.S. Environmental Protection Agency (EPA) is the sole agency with the authority to determine whether a non-hazardous secondary material fuel material is a solid waste for purposes of regulation under the CAA. This analysis does not constitute legal advice. However, EPA has stressed that facilities can make a self-implementing determination of whether a non-hazardous secondary material meets the regulatory criteria[1]. As such, this information should be instructive to WāstAway and the marketing of your Fluff fuel material.

[1] 78 Fed Reg 9159

In order to provide an adequate self-implementing determination, documentation must address whether Fluff is adequately processed and meets the *legitimacy criteria* specified in the NHSM rule. This analysis includes a description of the processing of secondary materials into Fluff at the WāstAway facility and why the processing meets the definition of processing per 40 CFR 241.2. As well, this analysis also describes how Fluff meets the legitimacy criteria for fuels in 40 CFR 241.3(d)(1), which includes the critical factor of comparing contaminants in Fluff to traditional fuels, and why it is our belief that Fluff would not be considered a "solid waste" per the NHSM rule.

Based on this analysis, per 40 CFR 241 and related Federal air regulations, I believe that Fluff should not cause a combustor to become subject to the Commercial and Industrial Solid Waste Incinerator (CISWI) rule (40 CFR 60 Subpart CCCC and DDDD).

If you have any questions or would like further information from us, please do not hesitate to contact myself or Karl Seltzer at (352) 377-5822 or mlee@kooglerassociates.com or kseltzer@kooglerassociates.com.

Sincerely,

Max Lee, Ph.D., P.E.
President
Koogler & Associates, Inc.

Via Email only:

Karl Seltzer, *KSeltzer@kooglerassociates.com*
Bill Martin, *BMartin@BouldinCorp.com*
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Enc.: Appendix 1 and 2

NON-HAZARDOUS SECONDARY MATERIAL ASSESSMENT REPORT
WĀSTAWAY, LLC
WĀSTAWAY FLUFF MATERIAL®

PREPARED FOR:
WāstAway, LLC
195 Mt. View Industrial Drive
Morrison, TN 37357

PREPARED BY:
Koogler and Associates, Inc.
4014 NW 13th St.
Gainesville, FL 32609

Assessment Date: June 30, 2014

808-14-01

Contents

WāstAway LLC (WāstAway) produces an alternative fuel material product called Fluff®, referred to herein as "Fluff". WāstAway contracted Koogler and Associates (Koogler) to complete a company internal assessment to address whether or not Fluff would be identified as a "solid waste" per 40 CFR 241 (Identification of Non-hazardous Secondary Materials as Solid Waste (NHSM rule)) for purposes of air emissions regulation under the federal Clean Air Act (CAA), Section 129 when used as a fuel source in a combustion process for energy recovery. If Fluff were to be considered a solid waste, the combustor of Fluff would be regulated as an incinerator under Section 129 of the CAA.

Based on the information and data provided by WāstAway, the applicable federal rules and guidance, and Koogler's prior experience with similar assessments, Koogler has prepared the following analysis to provide an assessment for internal company purposes. It should be noted that the U.S. Environmental Protection Agency (EPA) is the sole agency with the authority to determine whether a non-hazardous secondary material fuel material is a solid waste for purposes of regulation under the CAA. This analysis does not constitute legal advice. However, EPA has stressed that facilities can make a self-implementing determination of whether a non-hazardous secondary material meets the regulatory criteria[2]. As such, this information should be instructive to WāstAway and the marketing of your Fluff fuel material.

In order to provide an adequate self-implementing determination, documentation must address whether Fluff is adequately processed and meets the *legitimacy criteria* specified in the NHSM rule. This analysis includes a description of the processing of secondary materials into Fluff at the WāstAway facility and why the processing meets the definition of processing per 40 CFR 241.2. As well, this analysis also describes how Fluff meets the legitimacy criteria for fuels in 40 CFR 241.3(d)(1), which includes the critical factor of comparing contaminants in Fluff to traditional fuels, and why it is our opinion that Fluff would not be considered a "solid waste" per the NHSM rule.

1.0 Introduction to WāstAway Fluff

The WāstAway Fluff fuel pellets are a secondary material processed from sorted municipal solid waste that is processed at the WāstAway facility in Morrison, Tennessee. The primary use of the Fluff pellets is for traditional fuel replacement in combustors (e.g., boilers and cement kilns). These pellets are shown to have a similar heating value to coal and are locally produced, eliminating the costly and inefficient transportation of traditional fuels from their mined initial locations. Additionally, since these are secondary and not primary (i.e., virgin) fuel materials, the greenhouse gas footprint is significantly reduced, when considering a life cycle analysis approach.

The Fluff pellets can be handled and stored similar to traditional fuels, such as coal, which enables a combustor to utilize these fuel materials without having to significantly alter their fuel storage or injection process. Unlike some refuse-derived and other solid recovered fuels, Fluff

[2] 78 Fed Reg 9159

pellets do not have pathogens and secondary odors due to the sterilization process at WāstAway's facility. This also enables an extended storage capacity for the fuel materials.

A majority of the Fluff composition is organics, fiberous materials (paper, etc.) and plastics. The overall process produces a consistent fuel material that has similar contaminant concentrations and moistures to traditional fuels, which makes it a strong candidate for an alternative fuel source.

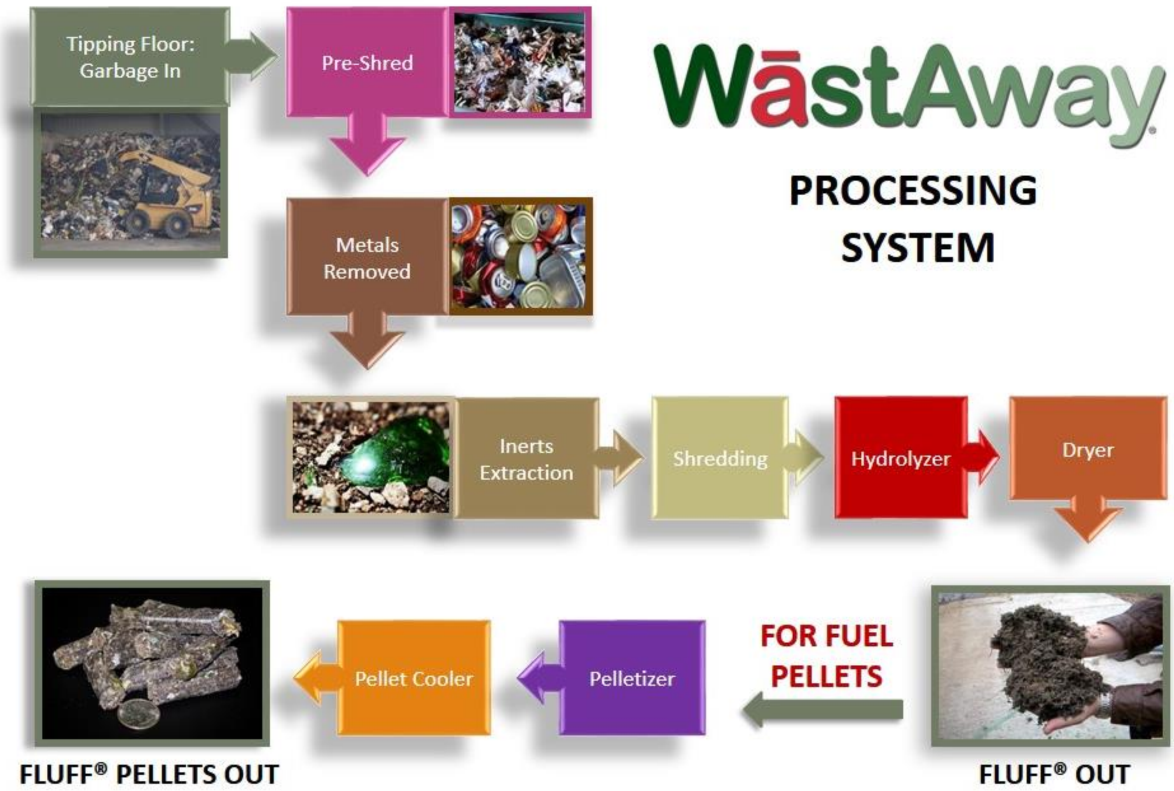
2.0 Processing Requirements

As defined in 40 CFR 241.2, "*processing* means any operations that transform discarded non-hazardous secondary material into a non-waste fuel or non-waste ingredient product." Processing may include, but is not limited to, operations necessary to: remove or destroy contaminants, significantly improve the fuel characteristics of the material, e.g., sizing or drying the material in combination with other operations; chemically improve the as-fired energy content; or improve the ingredient characteristics." EPA has clearly stated that sizing alone is not adequate processing. Removal of contaminants (e.g., selecting and sorting input materials) in addition to sizing is considered adequate by EPA.

The primary raw materials, municipal solid waste, is brought to the facility and deposited onto the tipping floor. From the tipping floor, the materials are moved to a pre-shredding process to reduce material size. Following the pre-shred, metal (ferrous and aluminum) and inert extraction processes remove these unwanted materials from the processing stream and are separated for further recycling.

The remaining materials continue through processing where they are further shredded and then enter the WāstAway patented hydrolyzer for sterilization and additional processing. Following the sterilization process, the materials enter a dryer where the moisture is stripped from the fuel materials, making them a highly consistent fuel product. At this point, the fuel materials are in their "Fluff" format. For customer preference, ease of transportation and storage, the Fluff materials are then pelletized and cooled to make the final fuel product, referred to as Fluff pellets. The Fluff and Fluff pellets have the same composition, with the exception of form and density.

The finished product is stored in the WāstAway facility, which is an entirely enclosed facility. This limits the introduction of unwanted moisture or contaminants to the clean fuel product. The following diagram outlines the overall manufacturing process. Overall, the Fluff processing includes size reduction, metals removal, inerts removal, sterilization, overall structural change, additional size reduction and drying. This controlled and consistent processing ensures consistent and high quality fuel materials that combustors can rely on for traditional fuel replacement.



In the next section, we discuss that the quality and consistency of WāstAway's Fluff and the low contaminant levels in this fuel material. When compared to traditional fuels, evidence of comparable contaminant concentrations between the NHSM and traditional fuels provides further confirmation that sufficient processing, as envisioned by the NHSM Rule, has taken place.[3]

3.0 The legitimacy criteria

In addition to the analysis of whether sufficient processing occurs while manufacturing Fluff, as specified in 40 CFR 241.3(d)(1), the legitimacy criteria for non-hazardous secondary materials used as a fuel in combustion units address the following characteristics:

1) Managed as a Valuable Commodity: The non-hazardous secondary material must be managed as a valuable commodity. This includes the storage of the material prior to use not exceeding reasonable time frames, management of the materials in a manner consistent with an analogous fuel or, when there is no analogous fuel, adequate containment to prevent releases to the environment.
2) Meaningful Heating Value: The non-hazardous secondary material must have a meaningful heating value and be used as a fuel in a combustion unit that recovers energy.

[3] 40 CFR 241.4(a)(5)(i)

3) Comparable Contaminants: The non-hazardous secondary material must contain contaminants at levels comparable in concentration or lower than those in traditional fuels for which the combustion unit was designed to burn. Despite the fact that the NHSM rule is a determinant for applicable air pollution regulations, the NHSM rule require this comparison to be based only on the "contaminants" within the physical fuel material.

3.1 Management Requirements as a Valuable Commodity

The entirety of the WāstAway Fluff fuel material processing takes place in the completely enclosed facility in Morrison, Tennessee, which is a controlled and monitored environment. The materials that are made into the Fluff fuel materials are transported by front end loader and various conveyor belts from the various processing stages throughout the system and the finished product is free of odors and pathogens, which are oftentimes associated with refuse-derived fuels. The final product is then stored inside the facility to eliminate the potential for secondary contamination or moisture introduction. As evident in the contaminant comparison discussed below, the final fuel product has consistent, low moisture values and an overall high predictability for low and comparable contaminant concentrations.

In addition, Fluff is sold as a commodity to combustors for beneficial energy recovery. Fluff is sold by written contract with manifesting, shipping, and delivery to customers in manners that are similar to traditional fuels or other commodities. Due to these circumstances, it is our belief that the WāstAway Fluff fuel materials adequately meet the standards needed for a NHSM to be considered a valuable commodity that are adequately managed.

3.2 Meaningful Heating Value

40 CFR 241 states that non-hazardous secondary materials with an energy value greater than 5,000 Btu/lb, as fired, generally have a meaningful heating value[4]. Based on results from careful sampling and analysis (discussed in detail in the following section), the average heating content of Fluff, moisture free, was 8,500 Btu/lb, with a standard deviation of 217 Btu/lb (about 2.5% normalized standard error). Clearly, these results display that Fluff is a highly consistent product that well exceeds the general benchmark value of 5,000 Btu/lb. Furthermore, based on the sampling period, the overall variation of heating value (2.5% normalized standard error with values ranging from 8,214 to 8,782 Btu/lb) indicated that the fuel is a highly consistent fuel material and contains a high heat content for combustion.

3.3 Comparison of Contaminants to Traditional Fuels

To properly understand the contaminant comparison criteria, one must carefully analyze the following rule statement;

[4] 76 Fed Reg 15541

The non-hazardous secondary material must contain contaminants or groups of contaminants at levels comparable in concentration to or lower than those in traditional fuel(s) which the combustion unit is designed to burn.

A contaminant is defined in the NHSM rule as any of the regulated air pollutants under the NESHAP program or the Section 129 program. The NESHAP (National Emission Standards of Hazardous Air Pollutants) program includes regulation of 188 potential chemicals or groups of chemicals under the Clean Air Act. The Section 129 Program includes regulation of 9 chemicals under the Clean Air Act. Because air pollutants cannot either be present in solid/liquid material or cannot be scientifically connected to constituents in sold/liquid materials, EPA has made several caveats to what is a contaminant in solid/liquid fuels[5].

3.3.1 Applying a Statistical Comparison

To properly compare WāstAway's Fluff with traditional fuels, a statistical comparison of "contaminant" concentrations has been carried out. As stated in the revisions to the final rule published in February 7, 2013,[6] EPA states that using a statistical analysis to carry out a comparison and basing the main comparison around the upper end of statistical ranges is allowed, else "Anything less could result in 'traditional fuel' samples being considered solid waste if burned in the very combustion units designed to burn them.[7]" As such, we carried out a statistical analysis of the samples and compared the results to the maximum range provided by OAQPS for the coal and biomass categories of traditional fuels. This methodology of comparison has been reviewed and approved by EPA for other NHSM[8].

The statistical approach carried out in this analysis utilized the Upper Prediction Limit (UPL) of the Fluff analysis dataset. The UPL is an indicator of what a future measurement would report based on the current set of available data, at a specified confidence level. For this analysis, a 90% UPL was determined using ProUCL software[9], which is a software package provided by EPA for analysis of environmental datasets with and without non-detect observations. Many contaminant comparisons reviewed by EPA have been based on datasets that utilized the comparison of the maximum traditional fuel value and the 90% UPL (as determined by ProUCL software) of the NHSM in question.

3.3.2 Selection of Contaminants for Comparison

The preamble of the rule allows knowledge of the material and its processing as a means to assert which contaminants are likely present in the secondary fuel material[10]. Based on Koogler's experience with the NHSM rule making, our knowledge of EPA's guidance under the revised

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[5] 78 Fed Reg 9140: Chlorine, Fluorine, Nitrogen and Sulfur are considered contaminants based on their status as a precursor to air emissions.
[6] http://www.gpo.gov/fdsys/pkg/FR-2013-02-07/pdf/2012-31632.pdf
[7] 78 Fed Reg 9151
[8] EPA Comfort Letter for SpecFUEL; dated 8/22/2013
[9] http://www.epa.gov/osp/hstl/tsc/software.htm
[10] 78 Fed Reg 9139

final NHSM rule published on February 7, 2013[11], and our experience with similar fuel materials that have obtained EPA issued comfort letters, we selected which contaminants should be analyzed in this analysis. In total, this contaminant comparison consists of a comparison between Fluff and traditional fuel contaminant concentrations, as reported in the EPA OAQPS reference document, "Contaminant Concentrations in Traditional Fuels: Tables for Comparison" issued November 29, 2011.

We reviewed all potential *contaminants* (i.e., all 188 Hazardous Air Pollutants and nine 129 pollutants as specified in the 40 CFR 241.2) and the NHSM rule guidance when making the determination to include some contaminants, including nitrogen.[12] The laboratory analytical methods described below were used to measure metals, halogens, volatile organic and semi-volatile organic compounds selected from the list of potential NESHAP/Section 129 contaminants.

In total, volatile organic compounds (VOC's) were analyzed using EPA Method 8260B, semi-volatile organic compounds (SVOC's) using EPA Method 8270C, formaldehyde using EPA Method 8315A, metals using EPA Method 6010B, anions using EPA Method 9056 and various approved methods for proximate and ultimate testing (which includes heating value, moisture, ash content, nitrogen content, etc.).

3.3.3 Sampling and Analysis Plan

To ensure that the analysis data used for this determination was representative and consistent and reliable, a sampling and analysis plan was prepared for WāstAway to carry out, as outlined by Koogler. See Appendix 2 for Sampling and Analysis Plan. This included composited daily samples from seven working days, spanning March 17 – March 27, 2014. Grab samples were taken on an hourly basis prior to the pelletization process that physically converts the Fluff to Fluff pellets, without chemical adjustments. From there, WāstAway shipped the daily composite samples to a NELAC-certified laboratory, ALS Environmental[13], for analysis. To ensure that a proper subsample from each daily composite sample was analyzed, the composite samples were freeze dried and crushed to a consistent and smaller nominal size (generally in the range of 100 μm diameter). The samples were then analyzed for the following parameters/contaminants:

- Antimony, Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Lead, Manganese, Nickel, Selenium (Method 6010B)
- Mercury (Method 7471B)
- Formaldehyde (Method 8315A)
- Chloride, Fluoride (Method 9056)

[11] http://www.gpo.gov/fdsys/pkg/FR-2013-02-07/pdf/2012-31632.pdf
[12] 78 Fed Reg 9140
[13] http://www.alsglobal.com/

- Gross Calorific Values, Proximate, Ultimate (ASTM D5865-02, ASTM D3172-07a/D3176-09, ASTM D3173-03, ASTM D3175-07, ASTM D3175-07 Modified, ASTM D4239-08, ASTM D482-03 Modified, ASTM D5373-08, ASTM D5373-08 Modified

3.3.4 Analytical Results

A summary of the results is shown in the attached Appendix 1.

The comparison in the Appendix 1 table highlights the maximum values for wood (green) and coal (brown). For each contaminant, the lowest maximum value of wood and coal from the EPA OAQPS database is compared to the UPL for Fluff. For example, the arsenic lower maximum value of wood and coal ((wood and biomass (6.8, 298 ppm), and coal (174 ppm)) of 6.8 is compared to the 90% UPL value for Fluff of 2.1 ppm. Both values are on a dry basis. Since the Fluff value is lower than 6.8 ppm, it is therefore concluded that the Fluff arsenic concentration is comparable to both wood and coal. It should be noted that EPA has not clearly defined what difference of measurement is not comparable.[14] However, EPA has approved this methodology of comparison in comfort letters and based on results of this methodology, proposed non-waste determinations rulemaking for C&D wood and other NHSM.

As seen in the Appendix 1 table, all of the contaminants are significantly lower than the values reported in the EPA OAQPS November 29, 2011 memo, with the exception of antimony. In addition to antimony, bis(2-ethylhexyl)phthalate, a common semi-volatile organic compound which is frequent in waste streams as a plasticizer, reported high values. In comfort letters, EPA has addressed similar situations of data, as discussed below, and maintained such contaminants do not make the NHSM not comparable. Nonetheless, following EPA approved contaminant comparison techniques, it is our opinion that these contaminants will not prohibit Fluff from achieving comparable contaminant concentration. These strategies are further described and outlined below.

3.3.4.1 Comparability of Antimony Levels in Fluff

In the NHSM proposed rule, dated December 23, 2011, the preamble (FR Vol 76, No. 247) states the following:

> *While persons may satisfy the contaminant legitimacy criterion on a contaminant-by-contaminant basis, comparing groups of contaminants in the NHSM to similar groups in traditional fuels could also be appropriate, provided the grouped contaminants share physical and chemical properties that influence behavior in the combustion unit prior to the point where emissions occur. Volatility, the presence of specific elements, and compound structure are three such properties.*
> (FR Vol. 76, No. 247, pg. 80477)

[14] 78 Fed Reg 9152

As such, a comparison of a low volatile metals (LVM) grouping was carried out. Low volatile metals are a group of metals that include antimony, arsenic, beryllium, chromium, cobalt, manganese and nickel. However, for this analysis, manganese and nickel were not included in the LVM grouping due to their much higher concentration in solid traditional fuels, such as clean wood and biomass. These higher concentrations would otherwise make a non-representative comparison when doing a contaminant comparison. As such, the LVM contaminant group used in this analysis strictly included antimony, arsenic, beryllium, chromium and cobalt.

As seen in the comparison table in Appendix 1, the LVM group 90% UPL value for Fluff was 104 ppm. This value is lower than the lowest maximum LVM group value for the traditional fuels, which is the maximum literary source value reported for wood and biomass (187 ppm). The coal contaminant concentrations for total LVM's were reportedly higher (580 ppm & 867 ppm). These higher LVM grouping values are due in large part to the higher values of arsenic and chromium that are seen in traditional fuels. Meanwhile, antimony is relatively low in these traditional fuels. In MSW, antimony typically exists due to its presence in flame retardant materials. Nonetheless, when carrying out this LVM grouping comparison, those grouped metals show contaminant comparability similar to or significantly lower than traditional fuels.

3.3.4.2 Comparability of SVOC Levels in Fluff

DEHP, or bis(2-ethylhexyl)phthalate, is a chemical that is mass produced and used in plastics, resins, consumer products and building materials. In general, phthalates are used as plasticizers to enhance the durability and flexibility of plastics and other polymers[15]. Thus, the presence of DEHP in Fluff is not unexpected. Given the fact that DEHP is synthesized through bulk manufacturing processes (air releases from the plasticizer manufacturing processes are the reason for DEHP to be listed as a HAP, not from combustion) from traditional fuel materials (i.e., petroleum products), when doing a direct comparison of DEHP to traditional fuels, a contaminant comparison will never be possible due to the fact that petroleum-synthesized plastic materials are not present in coal or wood/biomass. As such, a group comparison was again utilized for the contaminant comparison of this HAP.

While coal and wood/biomass do not contain plastics materials and, in turn, DEHP, other organic compounds (HAPs) had to be considered when doing a contaminant comparison with traditional fuels. In the case of coal, and described in the EPA traditional fuels table (issued November 29, 2011), there are several HAPs that can be potentially found in this traditional fuel. As such, a group comparison of total semi-volatile organic compounds (SVOC) was made. This compilation of SVOCs includes semi-volatile organic compounds and polycyclic aromatic hydrocarbons (PAHs). While the December 23, 2011 proposal states that total PAHs should be a distinct group (as shown in Table 8 of FR 76, Vol 241, pgs. 80479 and 80480), we believe PAHs can and should be grouped with the other semi-volatile organic compounds, since PAHs are a

[15] Stiles, R., Yang, I., Lippincott, R.L., Murphy, E., Buckley, B. "Potential Source of background contaminants in solid phase extraction and microextraction." Journal of Separation Science. 30:1029-1036. (2007).

compilation of organic compounds. In fact, according to the Laumann et al. (2011) document used by EPA for the reporting of PAHs in the November 29, 2011 traditional fuels table, the PAH values used in this document included Naphthalene, which is defined by EPA as a semi-volatile organic compound (SVOC) in the December 23, 2011 (FR Vol. 76, No 247, pgs 80479 and 80480). As such, for the Fluff pollutant comparison, the total grouping included all measured organic SVOCs.

In this comparison, the high values for coal were all reported by EPA in the traditional fuel comparison tables and no other literature sources were used. As seen in Appendix 1, the Fluff 90% UPL results yielded a total organic HAPs concentration of 578 mg/kg whereas the coal high values yielded a total organic HAPs concentration of 2,243 mg/kg. It should be noted that the only detected SVOC in the analysis of Fluff was DEHP.

Through this SVOC grouping comparison, we believe that Fluff does have semi-volatile organic compound pollutant concentrations lower than what is possible for coal. As such, WāstAway's Fluff fuel materials meet this specification of the legitimacy criteria.

3.3.5 Fuel Contaminant Consistency as a Measure of Quality

One of the most important properties to determine the capability of an alternative fuel in replacing a traditional fuel is the consistency of the alternative fuel product. The first component usually inspected in a fuel product to determine consistency is its heat content. The consistency of a fuel product's heat content is a critical factor to ensure the reliable and consistent thermal properties of combustion. This is especially important in energy boilers and cement kilns where these properties have significant consequences if a fuel product is unpredictable and inconsistent. As previously mentioned, the average heat content of WāstAway's Fluff dataset was 8,532 Btu/lb, with a standard deviation of 217 Btu/lb, or a 2.5% relative standard deviation from the mean over the course of the six samples. This dataset presents an extremely consistent fuel source, even when compared to traditional fuels such as coal, coke and clean biomass.

When performing the same analysis for the metal contaminants in the Fluff material, higher levels of relative standard deviation was found; however, these values were expected since the concentration values are orders of magnitude smaller than the numerical values measured for the fuel's heating content. Also, due to it minute scaling, higher levels of deviation are expected. The table below presents the average, standard deviation and relative standard deviation from the mean for each of the metal contaminants analyzed.

Contaminant	Average [mg/kg]	Standard Deviation [mg/kg]	Relative Standard Deviation from the Mean [%]
Antimony	46.1	6.4	13.9
Arsenic	1.9	0.3	16.5
Beryllium	0.1	0.1	77.9
Cadmium	1.0	0.2	16.0
Chromium	41.3	8.3	20.2
Cobalt	7.7	1.2	15.3

Lead	103.6	15.0	14.5
Manganese	163.7	100.1	61.1
Mercury	0.1	0.0	15.9
Nickel	14.9	8.5	57.0
Selenium	0.5	0.1	10.3

As seen in the table, even though a majority of the metal constituents are minute (in the mg/Kg concentration range), their relative standard deviation from the average value still remains low. This indicates a strong consistency and reliable fuel product.

4.0 Conclusion

The purpose of this analysis is to support an adequate internal self-implementing determination for WāstAway to document, identifying their Fluff fuel material as a fuel as outlined in 40 CFR 241 (i.e., the non-hazardous secondary materials (NHSM) rule) and not a solid waste for purposes of CISWI regulation.

This analysis describes the processing to make the Fluff material at the WāstAway facility and why the processing meets the definition of processing per 40 CFR 241.2. This analysis also describes how Fluff meets the legitimacy criteria for fuels in 40 CFR 241.3(d)(1), which includes the critical factor of comparing contaminants in Fluff to traditional fuels. Fluff is also managed as a valuable commodity and has meaningful heating value. As seen in the above analysis, Fluff shows contaminant levels comparable to coal and biomass for certain contaminants using a statistical analysis comparison of UPL values of Fluff samples when compared to maximum values from an EPA database specific to the NHSM rule. The specific contaminants were selected based on knowledge of processed input materials to Fluff and the experience of Koogler with the NHSM rule. Samples of Fluff were collected and analyzed based on a protocol developed by Koogler. Results of the comparison are shown in Appendix 1. Antimony and Bis(2-ethylhexyl)phthalate are the two contaminants at higher levels than wood or coal in the comparison. Koogler addressed these two contaminants based on experience with other similar materials and believes that these contaminants do not cause Fluff to be a solid waste.

The sample analysis shows the consistency of the Fluff materials to be extremely high and greater than that of coal indicating comparable, if not superior, combustion stability. Fluff has highly consistent properties with very low HAP metal content, high heat content, comparable halogens, sulfur, and nitrogen.

Overall, based on the information provided in this analysis, Koogler believes Fluff meets both the processing definition defined in 40 CFR 241.2 and the legitimacy criteria outlines in 40 CFR 241.3(d)(1). Accordingly, Koogler assesses that WāstAway's Fluff material should not be identified as a solid waste under the 40 CFR 241 regulations for the described conditions above. Please note that our determination is not legal opinion and we recommend that legal counsel provide opinion of this assessment.

Appendix 1

Compound	Units	Literary Sources[1]		OAQPS Databases[1]						WāstAway Fluff[2]			
		Wood and Biomass		Wood and Biomass			Coal						
		Min.	Max	Min.	Max	Avg.	Min.	Max	Avg.	Min.	Max	Avg.	90% UPL[3]
Antimony (Sb)	ppm	ND	**26**	ND	**6.0**	0.9	ND	**6.9**	1.7	35.7	54.3	46.1	**49.6 (a)**
Arsenic (As)	ppm	ND	**6.8**	ND	**298**	6.3	ND	**174**	8.2	1.6	2.5	1.9	**2.1 (a)**
Beryllium (Be)	ppm	--	**--**	ND	**10**	0.3	ND	**206**	1.9	0.02	0.17	0.07	**0.10 (a)**
Cadmium (Cd)	ppm	ND	**3**	ND	**17**	0.6	ND	**19**	0.6	0.8	1.3	1.0	**1.1 (a)**
Chromium (Cr)	ppm	ND	**130**	ND	**340**	5.9	ND	**168**	13.4	33.2	58.5	41.3	**45.8 (a)**
Cobalt (Co)	ppm	ND	**24**	ND	**213**	6.5	ND	**25.2**	6.9	6.3	9.8	7.7	**8.3 (a)**
Lead (Pb)	ppm	ND	**340**	ND	**229**	4.5	ND	**148**	8.7	80.3	124	103	**112 (a)**
Manganese (Mn)	ppm	7.9	**840**	ND	**15800**	302	ND	**512**	26.2	117	390	164	**212 (c)**
Mercury (Hg)	ppm	ND	**0.2**	ND	**1.1**	0.03	ND	**3.1**	0.09	0.08	0.14	0.12	**0.13 (a)**
Nickel (Ni)	ppm	ND	**540**	ND	**175**	2.8	ND	**730**	21.5	8.6	33.5	14.9	**19.5 (a)**
Selenium (Se)	ppm	ND	**2**	ND	**9.0**	1.1	ND	**74.3**	3.4	0.5	0.6	0.5	**0.5 (a)**
Total SVM	ppm	ND	**345**	ND	**255**	6.2	ND	**241**	12.7	82	126	105	**113 (a)**
Total LVM	ppm	ND	**187**	ND	**867**	20	ND	**580**	32	92	138	112	**104 (a)**
Chloride	ppm	ND	**2600**	ND	**5400**	259	ND	**9080**	992	2980	3190	3081	**3123 (a)**
Fluoride	ppm	ND	**300**	ND	**128**	32.4	ND	**178**	64.0	584	1090	893	**1010 (a)**
Total Halogens	ppm	ND	**2900**	ND	**5528**	291.4	ND	**9258**	1056	3575	4294	3985	**179 (a)**
Total SVOCs	ppm	1.6	**27.0**	--	**--**	--	28.3+	**2243+**	--	448	660	534	**577 (a)**
Formaldehyde	ppm	1.6	**27.0**	--	**--**	--	--	**--**	--	2.9	7.9	4.0	**4.97 (b)**
Nitrogen	wt %	0.02	**3.95**	0.22	**0.46**	0.346	13.6	**54.0**	15.1	0.9	1.0	1.0	**1.0 (a)**
Sulfur	wt %	ND	**0.87**	ND	**0.61**	0.070	0.74	**61.3**	13.6	0.2	0.2	0.2	**0.22 (a)**
HHV	Btu/lb	--	**--**	--	**--**	--	--	**--**	--	8214	8782	8532	**8650 (a)**
Moisture	wt %	--	**--**	--	**--**	--	--	**--**	--	1.6	2.9	2.2	**2.4 (a)**

[1] EPA Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.
[2] WāstAway Fluff. Sampling Occurred Between 3/17/2014 – 3/27/2014. All values reported as Dry Basis.
[3] UPL, or Upper Prediction Limit, based on the type of distribution that best fit the data for the contaminant.
Notes: (a) Data appear Normal at 5% Significance Level - Used Normal Statistics; (b) Data appear Lognormal at 5% Significance Level - Used Lognormal Statistics; (c) Data Do Not Follow a Discernable Distribution at 5% Significance Level - Used Nonparametric Statistics
* - See above discussion of volatile organics from clean wood in comparison to C&D wood formaldehyde (pages 2-4)
HHV – High Heating Value; SVM – Semi-Volatile Metals (Pb, Cd, Se); LVM – Low Volatile Metals (Sb, As, Be, Cr, Co); Nickel and manganese generally act as low-volatile metals, and their much higher concentration in solid traditional fuels relative to arsenic and chromium would otherwise make a non-representative comparison. As such, nickel and manganese were not included in the grouping of LVM metals in this contaminant comparison.
+ Values taken from the Coal Literary Sources presented in EPA's Letter "Contaminant Concentrations in Traditional Fuels: Tables for Comparison." November 29, 2011.

Appendix 2

WāstAway, LLC
195 Mt. View Industrial Dr.
Morrison, TN 37357

**Material Analysis/Sampling Plan:
For WāstAway Materials**

Report Prepared by:
KOOGLER & ASSOCIATES, INC.
4014 NW 13th St.
Gainesville, FL 32609

Max Lee, Ph.D., P.E.
Karl Seltzer, E.I.

July 1, 2014

Implemented 3/17/14 through 3/26/2014

Introduction

WāstAway LLC (WāstAway) operates a facility in Morrison, TN which has the capacity of receiving and processing a wide variety of municipal solid waste into various, beneficial use materials. In total, the WāstAway Recycling System grinds municipal solid waste, sterilizes and breaks down organic molecules with high temperature and pressure steam and separates the organic fraction, called "fluff," from the recyclable glasses, metals and plastics. This fluff material can then be used as a fuel product, replacing traditional fuels such as coal or biomass, or as a soil amendment to increase organic matter and encourage plant growth. Overall, the materials that enter the facility go through wide array of best management practices (BMPs) that include, but are not limited to, screening, sorting, inspections and grinding. Ultimately, this reduces the strain on landfills, which generally receive a majority of these materials.

For the purposes of this analysis, the goal is to obtain a representative analysis of the materials that make their way through the WāstAway process line in a given week. Using the resulting data, a comparison of the pollutant concentrations within the WāstAway product is made with the pollutant concentrations in traditional fuels. The ultimate goal is to demonstrate the viability of the WāstAway product for use in energy recovery operations as a fuel in various industrial settings. As such, applicable regulations must be considered. The Nonhazardous Secondary Materials (NHSM) Rule, 40 CFR 241, plays a strong role in this possibility. In order to be considered a fuel and not a waste, which carries more stringent emission standards, a set of rules, titled the "legitimacy criteria", must be met. The legitimacy criteria, as specifically defined in 40 CFR 241.3(d)(1), requires the secondary materials to be managed as a valuable commodity, have a meaningful heating value and contain contaminant levels comparable in concentration or lower than those in traditional fuels for which the combustion unit was designed to burn. To verify the last two requirements of the legitimacy criteria, a rigid sampling plan and laboratory analysis will follow to ensure that these materials do indeed have a meaningful heating value and comparable contaminant concentrations.

Sampling Procedures (for WāstAway)

The ultimate goal of the sampling procedure is to ensure that the samples which are taken and analyzed are representative of the materials which are to be classified. As such, the sample collector should have firm understanding of the variability in material sizing and type of materials throughout the process.

Sampling equipment

Equipment should be prepared prior to collection and at a minimum needs to include:

1) Chain of Custody (COC) forms provided by analytical laboratory (see Attachment 1)
2) Sampling scoop (prefer to use hand picked samples from process line –as discussed)
3) Ziplock bags
4) Labels and pens for marking bags (ensure the labels match the sample ID that is on the COC. This includes the sampling day, date and plant name)

5) Shipment containers (Typically ice coolers. However, samples should be refrigerated until shipped at the end of the week.)
6) Camera (optional) to document time/location

Check of facility operations

Before sampling takes place, it is important that the collector check with the plant manager to confirm that the plant and all the associated equipment is running under normal operating conditions. If a problem exists in a process that could result in the non-normal finished product production, samples should not be collected and the reason samples not collected noted.

Time and volume of sample collection

The goal of this sampling plan is to collect and analyze several samples from the same sample stream, over the course of days to account for material variation. In total, there will be **one composite sample for each day of a seven day operating period**. Each daily composite sample will consist of a number of individual grab samples taken over the course of a working day. It is important that these individual grab samples be taken over the span of an entire working day. This will ensure a representative distribution of materials that make their way through, and not be a "snapshot" of a few particular material streams. As such, it is recommended that a grab sample be taken every 30 minutes, or that each analytical composite sample consist of at least 10 grab samples from the process line, spread out over the course of the day. Additionally, each grab should be small enough that the total analytical composite sample contains about **500 grams** (approximately one pound) of material.

The samples will more likely be representative the longer the sampling period lasts. Given the variability of input materials, the longer intervals of sampling will improve the long-term accuracy and reduce the potential for erred non-representative data. In summary, to alleviate some of this variability, extended sampling periods should be strictly followed.

Location of Sampling

The goal of sampling is to collect representative samples. Each sample is unique to a particular sample stream and location. As such, they should be collected directly from the process line, if possible. Disturbance of the materials, such as moving them to a new location, can alter the pile and unwanted sorting or settling may occur. This would result in unrepresentative samples. This concept of sampling near the origin or along the processing line will help alleviate some of this potential error. Ultimately, the collector should be familiar with the overall process and use his/her expertise to prevent collecting unrepresentative samples. The samples should closely approximate the same proportions of particle density, sizes and consistencies as the materials at their site of generation. For example, if the samples consist of an unrepresentative amount of smaller sized particles, a higher metals concentration in the results will probably be evident. Grab samples by hand would give the collector the best opportunity to approximate these proportions but, sampling equipment, such as a scooping mechanism, may be used if necessary.

The sampling location for this study will occur at **a location to be determined by the facility and Koogler**, to ensure a representative sample is taken. Additionally, it is recommended that pictures be taken of the sampling location.

Sampling Steps

1) Mark sample bag with the day, date and plant name (e.g., Monday 3/17/14-WāstAway), as well as the samplers initials.
2) After collection, seal the bag.
3) Fill in the attached Chain of Custody (COC) Client Sample ID, date and time as shown in the example COC.
4) Double pack the sample bag in two more bags, to ensure the bag remains moisture sealed.
5) Place the samples into a refrigerated environment until all the samples throughout the week are ready to be shipped.

Shipping of Samples (for WāstAway)

WāstAway should carefully package the samples in a sealed container. It is recommended that a cooler with a bag of ice be used and an **additional bag or liner be placed around the sample** to help ensure that no water permeates into the samples. The samples should then be sent to:

Columbia Analytical Services, Inc.
ATTN: Wendy Hyatt Cerda
3860 South Palo Verde Road
Suite 302
Tucson, AZ 85714

The project managers in charge of the sample analysis at Columbia Analytical Solutions will be Wendy Hyatt Cerda and Jerry Allen, and their contact information is as follows:

WENDY HYATT CERDA:
Phone- (520)-623-3381
Fax- (520)-573-1061
E-mail- WCerda@caslab.com

JERRY ALLEN:
Phone- (904)-739-2277
Fax- (904)-739-2011
E-mail- Jerry.Allen@alsglobal.com

Additionally, it is important that a **chain-of-custody be filled out and followed**.

Analytical Procedures (for ALS Global)

Sample Analysis

ALS Global will perform the following analyses on each sample to determine the overall composition of the WāstAway materials. In total, the following methods will be performed:

Method	Sample	Description	Location of Analysis
EPA Method 8260B	C	Volatile Organic Compounds	Jacksonville, FL
EPA Method 8270C	C	Semi-volatile Organic Compounds	Jacksonville, FL
EPA Method 6010B	C	Metals	Jacksonville, FL
EPA Method 7471A	C	Mercury	Jacksonville, FL
EPA Method 9056	C	Ion Chromatography (Bromide, Chloride, Fluoride)	Jacksonville, FL
EPA Method 8315A	C	Formaldehyde (Jerry Allen will send samples to Rochester, NY lab)	Rochester, NY
ASTM E 790	A	% Total Moisture	Tucson, AZ
ASTM D 3174	B	% Ash	Tucson, AZ
ASTM D 5142	B	% Volatile Matter	Tucson, AZ
ASTM D 3172	B	% Fixed Carbon	Tucson, AZ
ASTM D 5865	B	Gross Calorific Value	Tucson, AZ
ASTM D 4239	B	% Sulfur	Tucson, AZ
ASTM D 5373	B	% Carbon	Tucson, AZ
ASTM D 5373	B	% Hydrogen	Tucson, AZ
ASTM D 5373	B	% Nitrogen	Tucson, AZ
ASTM D 3176	B	% Oxygen	Tucson, AZ

Samples A, B, and C = see below for details

Sample Preparation

It is requested that the "Pulverizing Samples Employing a Freezer/Mill" in-house method (SOP Code: EXT-GRIND) be applied to the entirety of each sample. This will provide more homogeneous subsamples, which will enhance the reliability of the results. ALS will carry out this procedure. The procedure cools the sample matrix to cryogenic temperatures and pulverizes the materials through the use of a freezer mill. The pulverization will occur in an enclosed capsule by magnetically shuttling an enclosed steel impactor back and forth within the capsule. Since the entire cooling and pulverizing process occurs within the same enclosed terminal, the possibility of contamination and loss of sample is minimized while the recovery of the post-pulverized sample is simplified. In the end, it is estimated that the post-pulverized materials will be "sand" to "dust" sized particles.

It should be noted that before the cooling and pulverizing of each sample takes place, a portion of each sample will be carefully removed for the moisture analysis at the Tucson, AZ lab (Sample A). This is done due to the concern of unrepresentative moisture content results on post-cooled/pulverized materials.

Once the **entirety** of each sample has been cooled and pulverized, each sample will be divided up into three separate portions by ALS laboratories in Tucson, AZ. One portion will be used for the analyses that will occur in Tucson, AZ (Sample B). Another portion will be shipped to the ALS laboratory in Jacksonville, FL (by the ALS laboratory in Tucson, AZ) for the 8260, 8270, metal, mercury and ion chromatography analyses (sample C). The last portion will be saved in case additional sample mass is needed for any procedure or if another portion becomes inadvertently contaminated.

TETRA TECH

September 13, 2013

Mr. Mark S. Brown, CEO
WastAway
195 Mt. View Industrial Drive
Morrison, TN 37357
mbrown@bouldincorp.com

Subject: Tetra Tech Letter report – WastAway Process Engineered Fuel ("PEF") Review

Dear Mr. Brown,

WastAway engaged Tetra Tech as a consulting engineer to conduct a review of the CANMET report dated June 28, 2013 titled "Co-Firing Process Engineered Fuel with Highvale Coal, Combustion Characterization and Analysis". The primary purpose of the CANMET report is associated with the WastAway PEF used as a co-fired fuel or combustion related. CANMET suggested on page 9 of the report that WastAway seek "Advice on safe handling practices from an Engineering Firm specializing in the design of fuel storage and transport systems". Tetra Tech is a large global engineering consulting firm with experience in this subject matter. My personal experience in the Power Industry is over 30 years including extensive experience at three coal-fired power plants and 13 years of experience in design, consulting and power project review.

This letter report addresses the use of the WastAway PEF from a "concept design" view representing a design engineering perspective focusing on the comments made on the subjects of fuel handling and storage on pages (ii), (9) and (32) respectively in the report. The scope of work did not include thorough analysis of combustion related subjects and is limited to the reference pages associated with safe handling of WastAway Process Engineered Fuel. To be clear, there have not been any other preliminary engineering or design engineering tasks completed by Tetra Tech associated with any WastAway specific projects or fuel tests.

Executive Summary

Tetra Tech has reviewed the report provided and also completed a summary review of the codes and standards that will be required for a proposed project using the WastAway Process Engineered Fuel ("PEF") in a co-firing application. The engineering design of a proposed project completed by Tetra Tech (or any other qualified engineering consulting firm) will meet the codes and standards required in Canada and meet all state, local and federal requirements. The design engineering process will also be completed with good engineering practice. The safe handling and storage is an intricate part of this design process and is included in the engineering design for projects.

The comments made by CANMET on pages (ii), 9 and 32 were most certainly in the interest of "safety" with a concern for adequate safe storage and handling of fuel but were limited to the combustion analysis performed in the CANMET scope of work. Proper engineering design for safe storage and handling of PEF would involve different types of tests as defined in the applicable design codes and life safety engineering design standards. Specifically, volatility should be tested at lower temperatures than those indicated in the combustion testing.

Tetra Tech would defer the specific design basis for WastAway PEF systems to the design process results for specific projects. We would highlight the following general points for consideration:

- WastAway has not had a spontaneous ignition event of the PEF product or the "fluff" at existing project sites in operation or test sites.
- WastAway has "safely" stored and transported substantial quantities of fluff and PEF at the site in McMinneville TN and also other sites.
- The WastAway PEF is currently certified as pathogen free and is relatively odorless even when stored in piles at warehouse locations.
- The WastAway ASTME test results for source ignition material properties and explosion hazard are near 500 degrees C or 932 degrees F. This is well above the action level temperature defined in NFPA 654.
- The CanMet report was primarily focused on combustion characteristics of PEF which obviously occur at high temperatures. Volatility analysis for safe handling and storage should be determined at lower temperatures defined by life safety codes.
- Solid recovered fuels similar to PEF have been successfully used in Europe for over a decade without nitrogen blanketing or similar protective measures.
- WastAway PEF use in existing coal power plant pulverizers, ball mills or other equipment would need to be evaluated once a specific site has been determined.

In summary, we would not expect that the WastAway PEF product would require different methods than the current systems in place at other WastAway facilities with respect to safe handling and storage. We would not expect that nitrogen blanketing is necessary due to the long-term success at existing WastAway facilities. Inert gasses are not used in industry very often and also pose separate safety and health concerns. As stated above, the final design basis would be deferred to the engineering design firm selected and the design would meet the codes and standards that apply.

Design Engineer technical Summary, Dave Kachel Tetra Tech Golden, CO

1.0 WastAway Process Engineered Fuels

WastAway Services Inc. has developed a process engineered fuel (PEF) that uses municipal waste as its primary input. Canmet ENERGY was hired to conduct a preliminary combustion assessment of the PEF for use in a utility boiler. The PEF was co-fired with coal in a laboratory-scale research furnace to collect data on emissions and ash behavior. It was found that the PEF could be co-fired with coal in a 5% to 10% blend without a significant impact on the overall combustion behavior of the primary coal.

2.0 Dedicated Fuel Transport System

CANMET ENERGY recommended that a dedicated fuel storage and transport system be used. The final design will be dictated by the existing plant layout and applicable codes and standards, it has not been demonstrated that PEF requires separate systems to meet said standards.

3.0 Safe Handling Practices

CANMET ENERGY was concerned about safe handling practices for the PEF. The fuel could be handled by pneumatic conveying or belt conveyors. The type of conveying system will determine the appropriate safe handling practice. Requirements for the practice will be governed by applicable codes and standards, such as NFPA 654 – Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing and Handling of Combustible Particulate Solids.
Examples of other applicable Codes and Standards are as follows:

- ACGIH (American Conference of Governmental Industrial Hygienists) - Industrial Ventilation: A Manual of Recommended Practice.
- ASME Boiler and Pressure Vessel Code Section VIII
- ASME B31.1 Process Piping
- FM Data Sheet 7-76, Prevention and Mitigation of Combustible Dust Explosions and Fire.
- NFPA 69 – Standard on Explosion Prevention Systems
- NFPA 70 – National Electrical Code (NEC)
- NFPA 91 – Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists and Noncombustible Particulate Solids

4.0 Sampling and Monitoring

During a full scale trial test of the PEF, CANMET ENERGY recommends that the fuel and emissions should be closely monitored to determine the impact of co-firing the PEF with the existing plant coal supply. The small amount of PEF blended with the coal may not have a significant effect, it would be up to the power plant operator to determine what if any monitoring they deem necessary.

We appreciate the opportunity to support WastAway and potential test partners and look forward to project opportunities that may result. Please feel free to contact Dave or myself if you have additional questions.

Sincerely,

Paul K. Trygstad

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Analysis Report

October 26, 2017

VitaLogic RSU SAS
Carrera 15 No. 93-75
Oficina 309
Bogota D.C.,
Colombia

Client Sample ID: Vitalogic Fuel Test
Date Received: 10/13/2017
Matrix: Unknown

SGS Minerals Sample ID: 072-97797-001

		As Received	Dry	MAF
% Moisture, Total	[ASTM D 3302]	4.72		
% Ash	[ASTM D 7582]	10.45	10.97	
% Volatile Matter	[ASTM D 7582]	65.20	68.43	76.86
% Fixed Carbon	[ASTM D 3172]	19.63	20.60	23.14
Gross Calorific Value (Btu/lb)	[ASTM D 5865]	9587	10062	11301
% Sulfur	[ASTM D 4239]	0.15	0.16	
% Carbon	[ASTM D 5373]	47.63	49.98	
% Hydrogen	[ASTM D 5373]	6.25	6.56	
% Nitrogen	[ASTM D 5373]	0.90	0.94	
% Oxygen (Calc)	[ASTM D 3176]	29.90	31.39	

Tests	Result	Unit	Method
Pounds of Ash/mm Btu	10.90	lb	
Pounds of Sulfur/mm Btu	0.16	lb	
Pounds of SO2/mm Btu	0.31	lb	
Chlorine, Dry	13	ug/g	ASTM D 6721

Anthony Grimaldi, Branch Manager

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a division of Lehigh Hanson Materials Limited
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Delta, British Columbia V4G 1B8
P.O. Box 950 V4K 3S6
Tel (604) 946-0411

March 19, 2018

National Energy
13 S. Palafox Street
Pensacola, Florida, USA 32502

Attention: Mr. Dave Robau

Re: National Energy's Materials Recovery Facility

Dear Mr. Robau,

Lehigh Hanson Materials Limited supports the construction of the WastAway materials recovery facility for processing municipal solid waste (MSW) into a low carbon alternative fuel source. Our company is committed to global sustainability which includes the usage of an alternative fuel to displace the consumption of a fossil fuel such as coal. In fact Lehigh has built an alternative fuel handling system in our Delta cement plant facility that would be able to use the processed MSW for combustion purposes.

Based on demonstration trials done at our cement plant, one tonne of MSW based alternative fuel replaces 0.84 tonne of coal. The following table compares scenarios of the replacement of coal with alternative fuels and the significant reduction in greenhouse gas (GHG) emissions in combustion.

Scenario	MSW Alternative Fuel Consumption, mtph	Coal Equivalence Displacement, mtph	Percent Reduction in GHG Emissions in Combustion
1 (Baseline)	0	0	0
2	5.0	4.2	11%
3	8.5	7.1	18.5%
4	10.0	8.4	22%

If Lehigh is able to consume 10 mtph of this alternative fuel in our kiln operation, there would a 22% reduction in GHG emissions in combustion. Definitely this is a step in the right direction for sustainability.

Lehigh looks forward to benefitting from National Energy's venture in the new material recovery facility to provide a low carbon alternative fuel.

Yours truly,

Eileen J.J.

Eileen Jang, P.Eng.
Environmental Manager

Cc: K. Stuehmer,P.Eng., Vice President of Cement Operations, Lehigh Hanson Materials Ltd
D. Loustalet, Plant Manager - Delta Plant, Lehigh Hanson Materials Ltd